

Overview of Concepts and Options for Sea Level Rise Adaptation in Delaware



Delaware SLR Advisory Committee
June 16, 2011

Where we are

- **Vulnerability Assessment**

- ✓ Exposure – What will be inundated and where?
- ✓ Impact – What are the effects of inundation

- **Adaptation Capacity Assessment**

- ✓ What are the specific adaptation options available for each exposure to SLR inundation?
- ✓ What programs, policies and funding exist to facilitate adaptation?

- **Adaptation Planning**

- ✓ Prioritization of adaption options
- ✓ Strategies to make improvements to policies, programs and funding to facilitate adaptation



Draft Schedule

June	July	August	September	October
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Finalize Templates

Data QA/QC

Exposure Maps drafted

Public Engagement

Set Adaptation Goals

ID and Assess Adaptation Strategies

Expert Outreach



Final Product

- A Document that:
 - ✓ Describes vulnerable resources
 - ✓ Provides detailed maps in an easy to use format
 - ✓ Describes potential adaptation strategies
 - ✓ Makes recommendations for policy, program and funding necessary to implement adaptation strategies
- A Document that will be a resource for:
 - ✓ State agencies
 - ✓ Local governments
 - ✓ Businesses
 - ✓ Citizens
- A Document that will inform implementation



Adaptation

“Adjustments in natural or human systems in response to actual or expected climactic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC)



Adjusting to the new normal

Defining Adaptation for Delaware

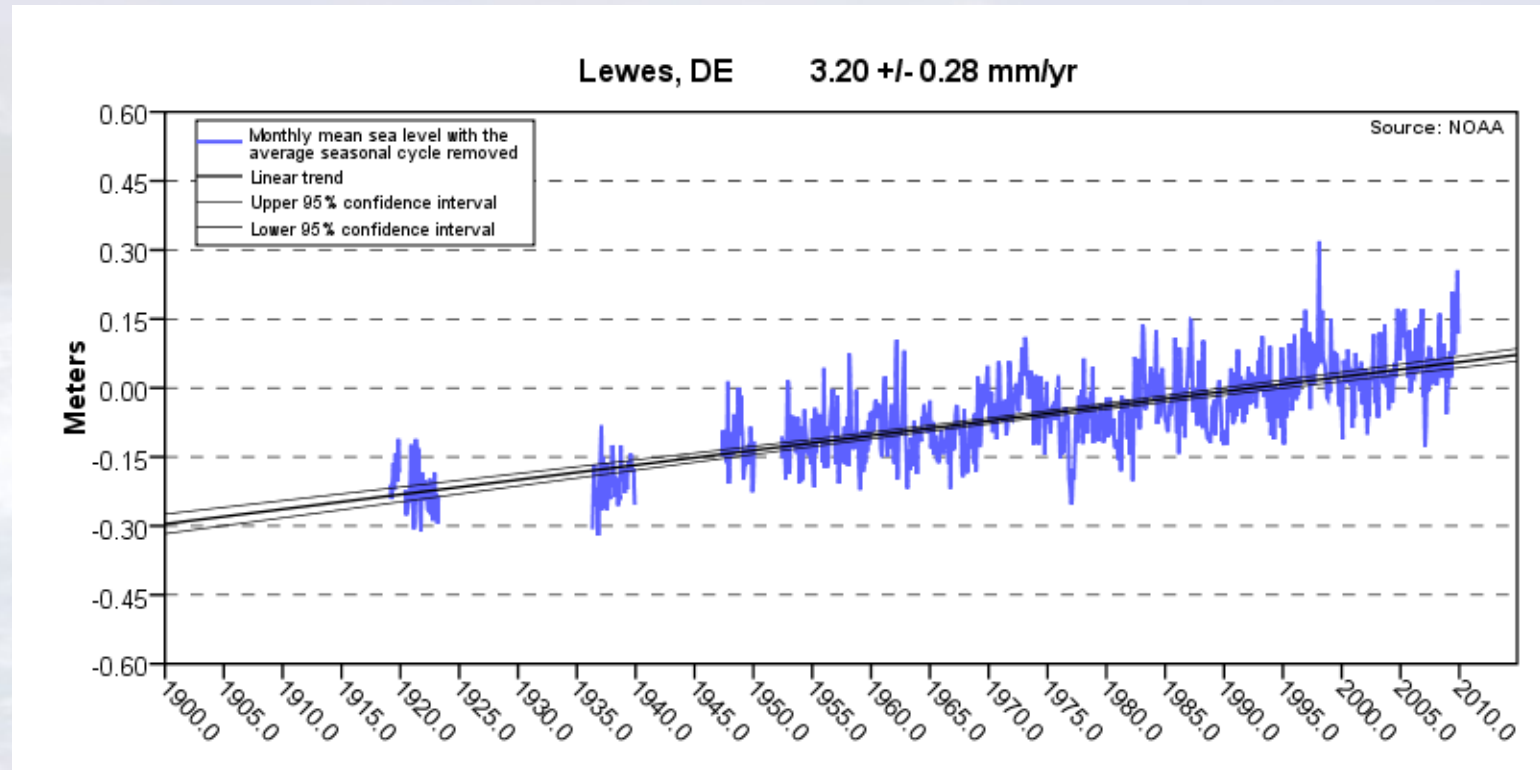
- “Normal” or Background Adaptation
 - ✓ Our current practices and approaches to cope with a certain range of sea level conditions.
 - ✓ Assumes current Sea Level conditions are stable.
- “Deliberate” Adaptation
 - ✓ Additional efforts in response to already discernable problems or expected increases in the rate of sea level rise.
 - ✓ Assumes rate of Sea Level Rise may or will increase and/or that past practices may no longer be sufficient.
- “Mal-Adaptation”
 - ✓ Ill advised actions that achieve minimal benefits, may be costly, and may create new liabilities to communities.
 - ✓ Can damage credibility of efforts.



Normal/Background Adaptation Conditions

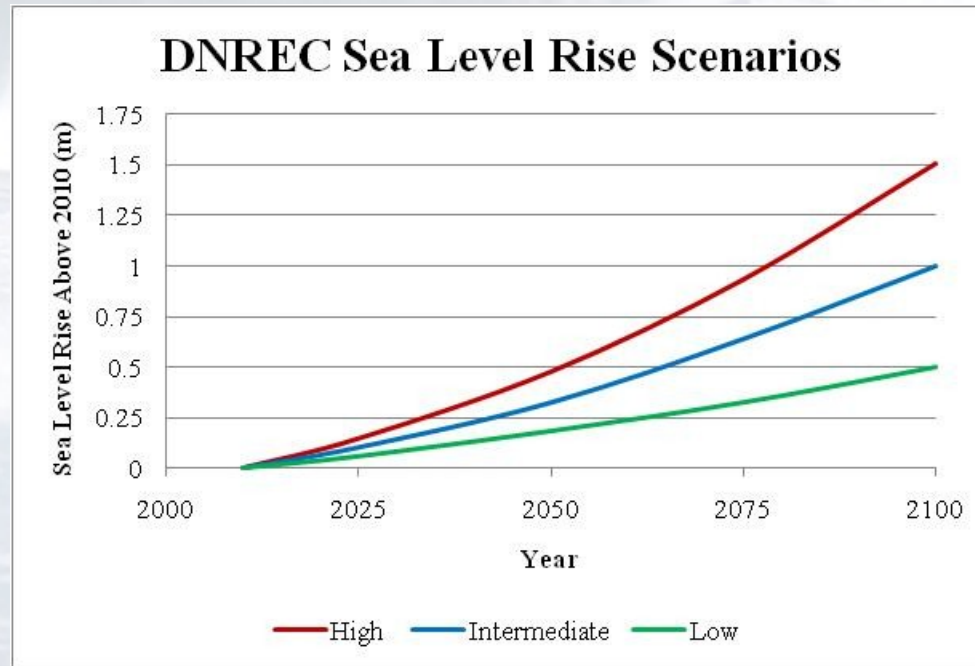
Global rate = 1.7 mm/yr

Delaware rate = 3.35 mm/yr (13 Inches/100 years)



Deliberate Adaptation Conditions

- **DNREC LSLR values for Delaware are 0.5, 1.0, and 1.5 meters by the year 2100.** These values represent the minimum, intermediate, and maximum rates expected based on currently available information

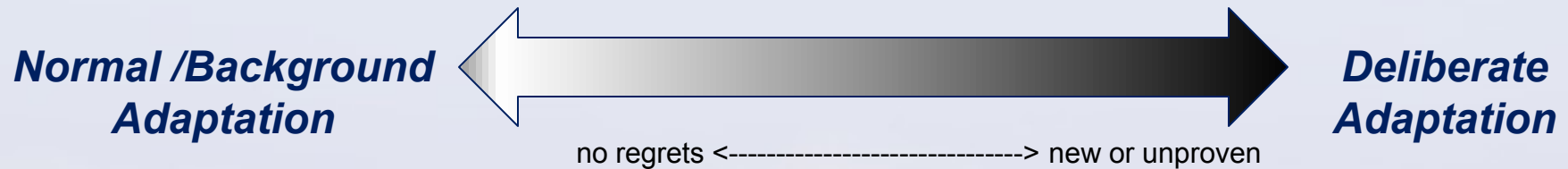


Striking a Balance



- A balance must be struck between initiating & endorsing ongoing adaptation process and undertaking common-sense efforts rather than overpromise or committing large resources to ill-advised efforts.
- Essential lessons and insights from background adaptation efforts.
- Innovation comes with testing new approaches for deliberate adaptation, especially for emerging problems.
- Provides flexible response while SLR/Climate Science emerges.
- Normal and Deliberate efforts are not necessarily mutually exclusive.

Build in Flexibility along Adaptation Continuum



- Changing scientific understanding
- Expanding knowledge about vulnerability and adaptation options and techniques.
- Emerging tools to support comprehensive decision making.
- Cost and funding realities.
- Social/Political will for action (especially for retreat).
- Deliberate adaptation capacity must be developed.
- Risk of Mal-Adaptation highest on both extremes.

Adaptation Options

- **Protection** – Dikes, Seawalls, Beach Nourishment
- **Managed Retreat** – Moving development out of harm's way w/planned abandonment, relocation, avoidance
- **Accommodation** – Elevate, flood proofing, behavioral changes
- **Unmanaged Retreat** – Do nothing.



Broad Marsh Dike, New Castle

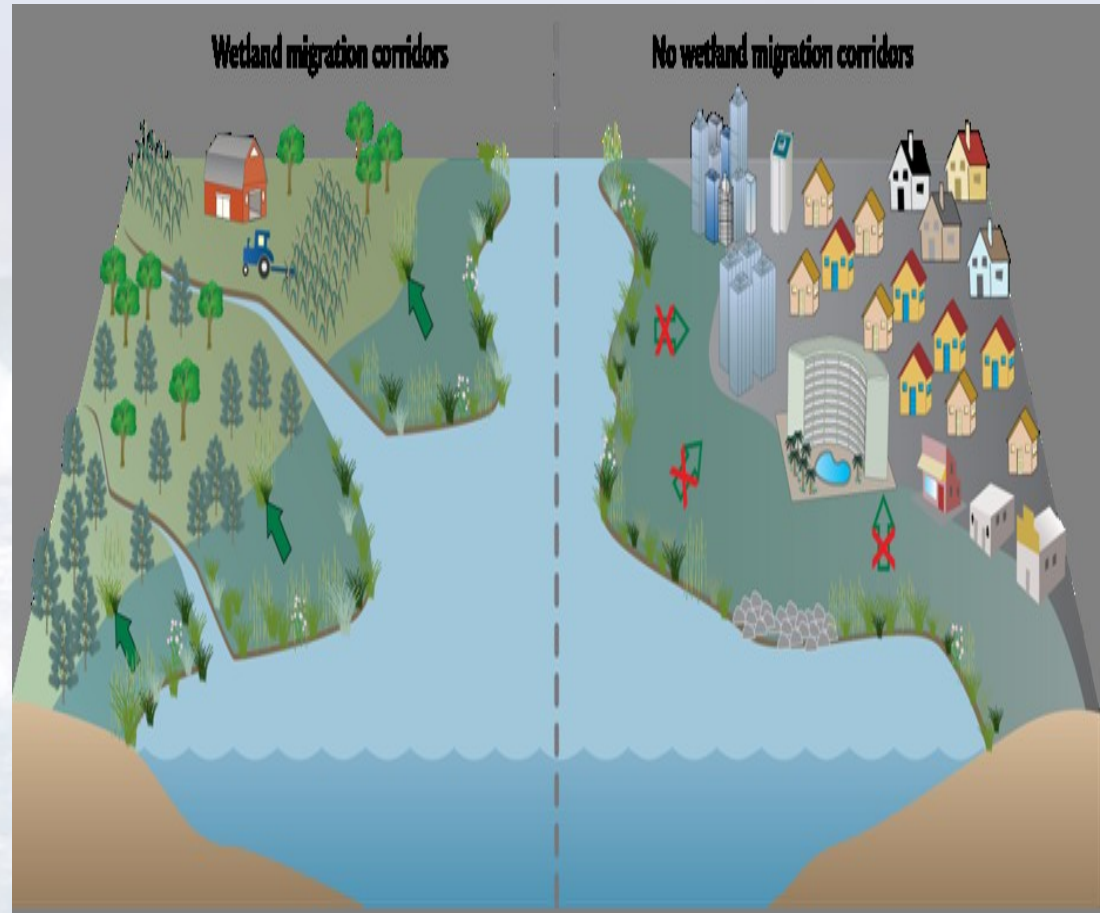
Protection

- Often Financially Unsustainable - inequitable use of public funds, property damage costs, maintenance and construction costs, damage to recreational values.
- Often Ecologically Unsustainable- Damages coastal ecosystems and processes, prohibits ecosystem retreat. (exceptions include action such as “living shoreline”)



Managed Retreat

- Ecologically sustainable by allowing ecosystem processes and retreat.
- Financially sustainable by avoiding costs associated with protection, particularly if long range planning occurs.
- Issues include: Property loss, land use conflicts, 'takings', existing incentives for coastal development, tourism and tax base impacts, short term vs. long term costs.



Accommodation

- Should be used as part of a larger plan for managed retreat- otherwise it will create similar financial and ecological costs as occur with protection.
- Often cost effective in the short term.
- Still allows development in hazard areas.
- May have other problems, such as limited evacuation.



Un-Managed Retreat

- Many risks of unknown impacts and costs.
- Often occurs as “protections” fail over time and/or in the absence of new solutions.
- Social/Political reaction to emotional impact of displacement can be challenging.



Port Mahon Road (Protection -> Retreat?)

- Failed protections and unwillingness to retreat have led to high maintenance costs.
- In late 1980's, plans were made for development of other boat ramps as part of expected retreat.
- Social/Political pressure has continued futile efforts to keep road open at high public cost.



N. Big Stone Beach (Managed Retreat)

- Only “True” Managed Retreat ever practiced in Delaware.
- Practiced for conservation purposes by a Private Conservation Organization.
- Properties did not have clear title (squatters), so private property rights did not come into play.



Fenwick Island (Managed Retreat)

- Structures built prior to beach protection act.
- Incremental retreat when rebuilt.
- Large lots allow landward retreat behind setback line.
- Limited application unless we have other policies such as rolling easements.
- Private property rights are prominent issues.



2002



2007

Delaware City



Delaware City Flood Wall (Protection/Accommodation)



Delaware City Sea Wall

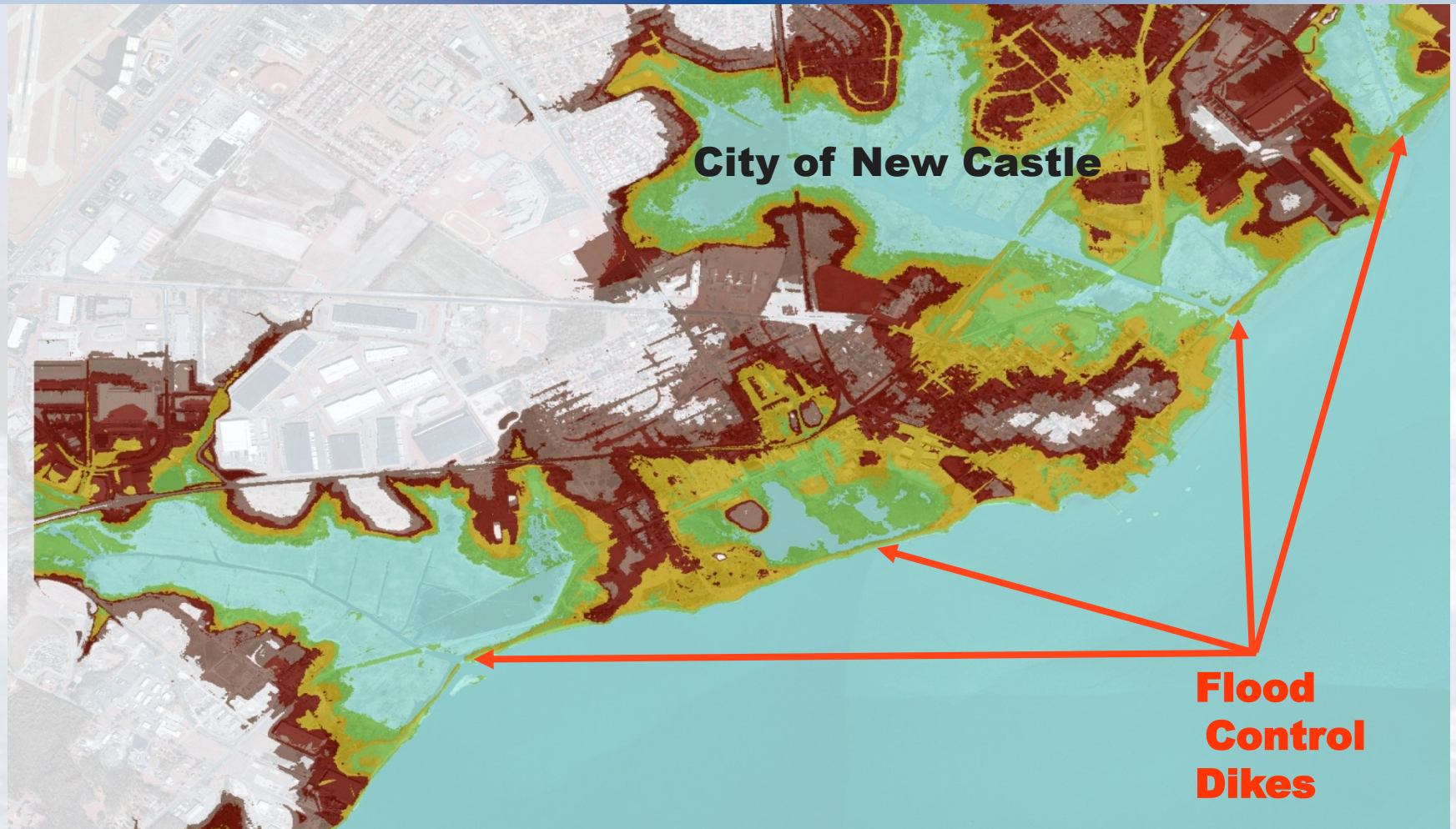
April 17, 2011 at 2:42 AM

Tide Level 3.38 ft. (1.03 M)
above MHHW



Del. City, April 2011 (Photo Source: News Journal)

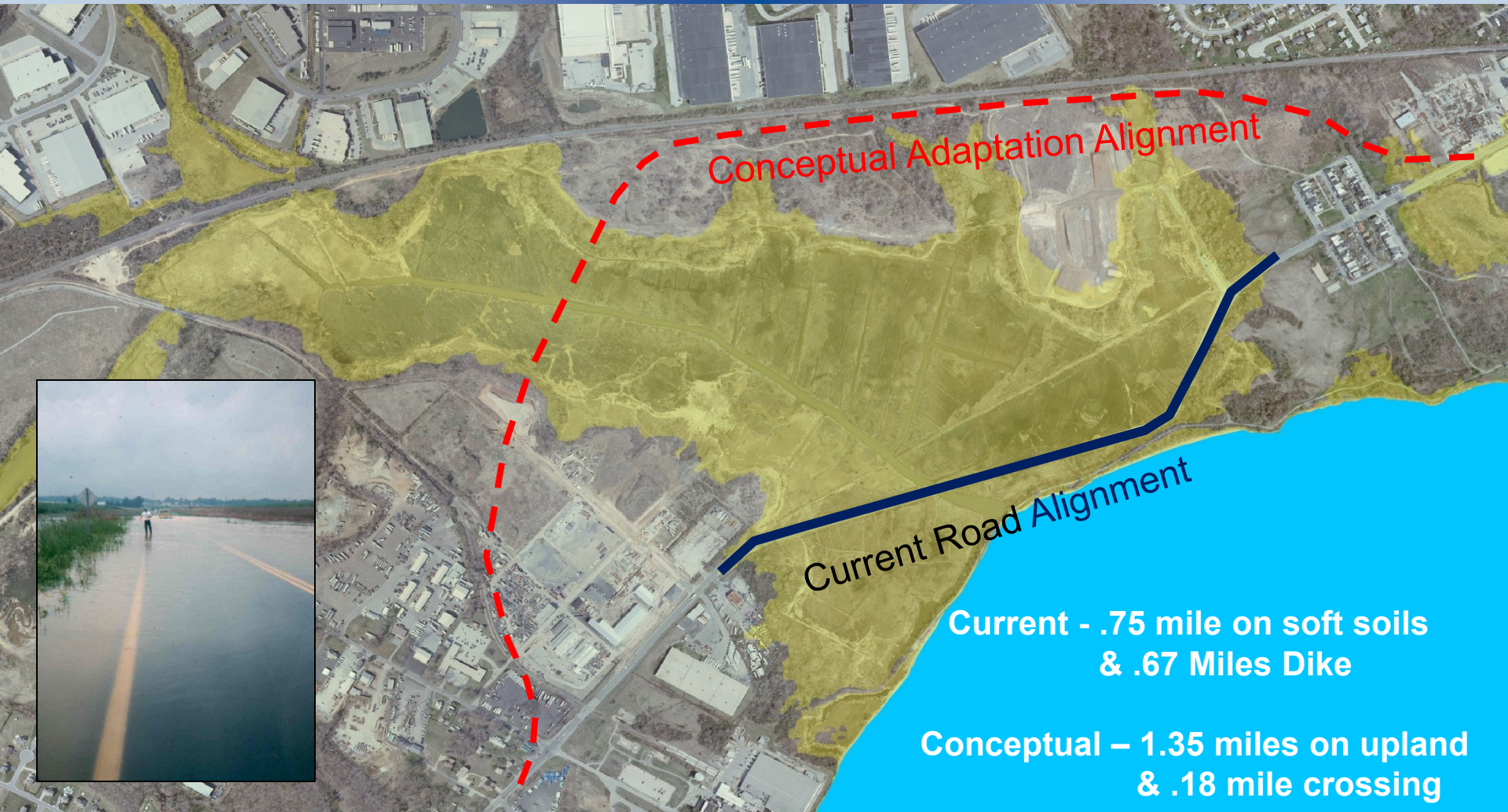
New Castle Coastal Defense Dikes



NCC Coast is Extensively Diked and Equipped with Tide Gates for Water Management



Del Rt. 9 and Army Creek Dike with 1.0 Meter Inundation



Next Steps

- Identify Adaptation Goals
- Identify and evaluate potential adaptation options
- Make recommendations for best adaptation options under various situations
- Make recommendations for capacity-building for adaptation planning and implementation.